

SERVICE INSTRUCTIONS

ASSEMBLY & DISASSEMBLY

T80X.X.H.P. 5000 PSI HYDRAULIC ACTUATORS

INTRODUCTION

This service procedure is offered as a guide to enable general maintenance to be performed on GH-Bettis T80X.X H.P. 5000 PSI "Scotch-Yoke" type hydraulic actuators.

BASIC TOOLS

Large Adjustable Wrench, Screwdriver, 1/4" Drift Punch, 1/2" Drive Socket Set, 24 oz. Ball Peen Hammer, Allen Wrench Set and Pry Bar.

REFERENCE GH-BETTIS MATERIALS

T80X.X H.P. Assembly Drawing 041751
Operating, Storage & Maintenance Instruction (OP/MAINT-002)
Dimension Base I Drawing 042350

GENERAL

NOTE: Numbers in parenthesis, indicate the bubble number (reference number) used on the GH-Bettis Assembly Drawing and actuator Bill of Material.

1. Rotate actuator to mid-stroke position.
2. Turn off air or power gas and depressurize power cylinder.
3. Remove all piping and accessories mounted on actuator.
4. Drain the hydraulic fluid from hydraulic cylinder (2-310) by removing cylinder drain plugs located on the outboard and inboard end of cylinder - bottom side.

GENERAL DISASSEMBLY

1. Remove socket cap screw (4-90), lockwasher (4-80) and nut retainer (4-70).
2. Remove hex nuts (4-20) and gasket seal (4-30) from tie bars (2-380). Remove blind end cap (4-10) and end cap gasket (3-10).
3. Remove four socket cap screws (1-180) from position indicator (1-170)/yoke weather cover (3-130) and remove position indicator/yoke weather cover.
4. Remove cover screws (1-90) and gasket seals (3-100).

5. Remove the housing cover (1-20).
NOTE: This piece will have a very tight fit.
6. Back-off hex jam nut (2-340) from yoke pin nut.
7. Unscrew piston rod from yoke pin nut (1-30) and remove. Flats are provided on the inboard end of the piston rod for wrench placement. DO NOT use a pipe wrench on the piston rod as it will mark the rod and cause seal leakage.
8. Remove hex jam nut (2-340) from piston rod.
9. Dis-assemble hydraulic cylinder from adapter by removing socket cap screws (2-360) and lockwashers (2-370). Remove end cap gasket (2-330) as well.
NOTE: Support cylinder during this step and carefully pull away from actuator to prevent scratching rod bushing and piston rod surfaces.
10. Remove cylinder adapter (2-320) by unscrewing tie bars (2-380) and sliding adapter away from housing. Remove end cap gasket (3-10).
11. Remove tie bars and rod bushing (2-50).
12. Remove the yoke rollers (1-50) and roller spacers (1-110) from the top of the yoke pin (1-40). Remove the yoke pin (1-40).
13. Remove yoke pin nut (1-30).
14. Remove bottom two roller spacers and yoke rollers from the housing.
15. The yoke (1-160) can now be removed by lifting it from the housing.
16. It is not necessary to remove the stop screws (1-60), drain plug (1-80), or grease fittings (1-70) to service the actuator.

GENERAL RE-ASSEMBLY

Remove all old seals and gaskets, taking care not to scratch or damage seal grooves.

Before starting the assembly of an actuator, all parts should be thoroughly cleaned, inspected and de-burred. Particular attention should be directed to threads, sealing surfaces and areas that will be subjected to sliding motion. After inspection, the parts should be carefully cleaned to remove all dirt, gaskets and other foreign material.

LUBRICATION REQUIREMENTS

1. Standard and high temperature service (-20°F to 350°F) use Kronaplate 100. Reference GH-Bettis Engineering Standard ESL-5.
2. Low temperature service (-100°F to 300°F) use Aeroshell 17. Reference GH-Bettis Engineering Standard ESL-4.

FLUID REQUIREMENTS

1. Standard and high temperature service (-35° F to 350°F) use Exxon Dexron II Automatic Transmission Fluid. Identification #D-20106. Reference GH-Bettis Engineering Standard ESF-1.
2. Low temperature service (-65°F to 180°F) use Exxon Univis J13 Hydraulic Fluid. Reference GH-Bettis Engineering Standard ESF-2.

ACTUATOR RE-ASSEMBLY

1. If removed, install drain plug (1-80) in actuator housing (1-10).
2. If removed, install the grease fittings (1-70) in the actuator housing (1-10) and cover (1-20). The fitting in the housing is located on the bottom of the housing, next to the lower yoke bearing area. The fitting in the cover is located on top of the cover in the upper yoke bearing area.

NOTE: Grease fitting (1-70) is optional, as of 3/1/83.

3. Take all the yoke rollers (1-50) and check to see if they will run (move) freely thru the tracks in the bottom of the housing and the housing cover.
4. Coat the yoke o-ring seal (3-50) with grease and install into the housing (1-10).
5. Inside the housing (1-10) apply grease to the tracks and yoke bore and orientate the housing with the yoke bore nearest you.
6. Apply grease to the yoke (1-160) lower bearing surface and install into the housing (1-10) as follows: Orientate the yoke arm to approximately a 45° position in either direction and lower into the housing. The hub with tapped holes faces up. Rotate the yoke back to approximately the mid-stroke (center) position.
7. Apply grease to the slots in the upper and lower yoke arm.
8. Apply grease to all surfaces of two of the yoke rollers (1-50) and two roller spacers (1-110). Place one yoke roller in the track in the bottom of the housing and position it under the slot in the yoke arms. Place a roller spacer (1-110) on top of the bottom yoke roller (1-50). Place a second yoke roller on top of the roller spacer in the slot in the lower yoke arm. Place another roller spacer (1-110) on top of the second yoke roller (1-50) and align the holes in the roller spacer and the yoke rollers.

9. Coat the upper and lower surfaces of the yoke pin nut (1-30) with grease and insert into position between the yoke arm, parallel to the track in the housing. Align the yoke pin hole with the yoke rollers and roller spacers.
10. Grease the yoke pin (1-40) and insert through the yoke pin nut (1-30), the two yoke rollers (1-50) and the two roller spacers (1-110).
11. Apply grease to all the surfaces of the two remaining yoke rollers (1-50) and two remaining roller spacers (1-110). Place one roller spacer on top of the yoke pin nut (1-30) then install the third yoke roller (1-50). Place the last roller spacer on top of the third yoke roller (1-50). Place the fourth and final yoke roller on to the yoke pin.

NOTE: The top roller will remain above the yoke arm and will engage the cover track when cover is installed.

12. Apply grease to the rod bushing (2-50), install it into the housing.
13. Coat end cap gasket (3-10) with grease on both sides and install over the rod bushing.
14. Install cylinder adapter (2-320) over bushing and slide adapter up against housing. As adapter is installed, be sure to align with bolt holes in housing.
15. Fasten cylinder adapter (2-320) to housing (1-10) by sliding tie bars into housing from left side, through tie bar holes on housing right side and installing into cylinder adapter.
16. Install end cap gasket (3-10) and blind end cap over tie bars - retain with hex nut and seal gasket.
17. Install nut retainer (4-70) with socket cap screw (4-90) and lockwasher (4-80).

NOTE: Hex nut flats must be aligned vertically to install nut retainer.

18. Do this step only if you have removed the housing stop screws (1-60). Place gasket (3-110) and jam nut (1-120) on the stop screw (1-60). Install stop screws in the housing. Screw the jam nut down against the actuator housing finger tight.
19. Coat cylinder adapter gasket (2-330) with grease on both sides. Extend piston rod from hydraulic cylinder and insert through cylinder adapter gasket (2-330), cylinder adapter, rod bushing and into housing. Insert socket cap screws (2-360) and lockwashers (2-370) through cylinder assembly and into adapter. **DO NOT TIGHTEN.**
20. Install jam nut (2-340) onto piston rod.
21. Install piston rod into yoke pin nut (1-30). Use wrench flats on inboard end of rod to tighten piston rod.
22. Back hex jam nut (2-340) against yoke pin nut (1-30). Tighten jam nut.
23. Tighten socket cap screws (2-360), one at a time and one across from one another until all screws are securely tightened..

24. Apply a thin coating of grease to both sides of the housing cover gasket (3-20).
25. Place the housing cover gasket (3-20) on the housing (1-10).
26. Coat the yoke o-ring seal (3-50) with grease and install in cover (1-20).
27. Apply grease to the cover yoke bore and the track in the housing cover (1-20).
28. Apply grease to the yoke upper bearing surface.
29. Install the housing cover (1-20), being careful not to damage the gasket (3-20) or yoke o-ring (3-50).
30. Install the cover screws (1-90) and seal gasket (3-100). **LEAVE FINGER TIGHT - DO NOT TIGHTEN.**
31. Do this step only if you have pulled the cover pins (1-130) or if you are replacing the cover pins. Drive the four pins (1-130) thru the cover (1-20) and into the housing (1-10) until the pin is flush with the cover.
NOTE: The pins are deeply grooved at one end, tapering to a smooth diameter at the other end. The pin should be installed smooth end first.
32. Tighten the cover screws (1-90).
33. With the yoke rotated to the full clockwise (CW) position (as shown on the assembly drawing) position the yoke weather cover (3-130)/position indicator (1-170) on the yoke with the pointer facing the front and perpendicular to the piston rod (2-170), secure with socket head cap screws (1-180).

TESTING HYDRAULIC ACTUATORS

A. ~~Leakage Test~~

NOTE: All sources of leakage to atmosphere and across the piston are to be checked using hydraulic pressure.

Procedure:

1. Cycle the actuator five times at 100% of the normal operating pressure (NOP), as marked on actuator name tag. This allows the seals to seek their proper working attitude.
2. Apply 100% of the maximum operating pressure (MOP), as marked on actuator name tag, and allow the unit to stabilize.
3. If there is any notable leakage, the actuator must be disassembled and the cause of leakage must be determined and corrected.
4. Shell tests the actuator by applying 1.5 times the maximum test pressure, as marked on actuator name tag, to both sides of the piston simultaneously for a period of two minutes. If any leakage occurs, the unit must be disassembled and the cause of leakage must be determined and corrected.
5. If an actuator was disassembled and repaired, the above leakage test must be performed again.

B. Operational (Functional) Test

NOTE: This test is used to verify proper function of the actuator and its' related system (accessories).

1. Cycle the actuator at 100% PSI operating pressure. Any jumpy or jerky operation, not attributed to seal drag or limited flow capacity, must be corrected.
2. All accessories, including solenoid valves, positioners, pressure switches, etc., must be hooked up and tested for proper operations and replaced if found defective.

RETURN TO SERVICE

1. If removed, install the snubber valve (1-130) in the cover (1-20) of the housing (1-10).
2. Re-install all piping and accessories that were removed.
3. Refer to GH-Bettis "Operating, Storage and Maintenance Instructions for GH-Bettis Rotary Valve Actuators" (OP/MAINT-001) for actuator start-up procedures.

FINAL QUALITY TESTING OF ACTUATORS

T80X.X H.P. 5000 PSI ACTUATOR

	NOMINAL OPERATING PRESSURE	MAXIMUM OPERAING PRESSURE	MAXIMUM ALLOWABLE WORKING PRESSURE
MODEL	(NOP)	(MOP)	(MAWP)
T803.2	Customer spec or N.A.	5000	6000